Decay Properties of ^{266}Bh

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Experiments performed at the LBNL in 1999 showed that the ^{249}Bk(^{22}Ne, xn)$^{271-x}$Bh (x = 4, 5) reaction could be used to prepare less neutron deficient isotopes of bohrium than those previously synthesized [7]. This experiment yielded five events assigned to ^{267}Bh and one event assigned to ^{266}Bh. The poor statistics of the latter result suggested the clear need for a new experiment designed to study the decay properties of ^{266}Bh and determine its suitability for chemical studies. Such an experiment was conducted during October 2000.

The LBNL 88-inch Cyclotron provided a beam of 153 MeV $^{22}Ne^{6+}$ (lab frame) at ~122 MeV (center of target , also lab frame) with a current of ~2.0 eμA. The total beam dose was ~0.4×10^{18} particles. This beam was delivered to our actinide target system in Cave 0 for reaction with the ^{249}Bk target. This target was prepared by molecular plating and had a thickness of 478 $\mu g/cm^2$, present as BkO_2. A helium jet containing KCl aerosols transported reaction products to our Merry-Go-round (MG) rotating wheel detection system. The MG was operated in parent-daughter mode [8] to minimize background and enhance the probability of detecting α-α correlations. Parent steps were 1.5 s and daughter modes lasted 120 s. Six pairs of PIPS particle detectors positioned above and below the wheel the provided alpha and fission detection. No x-ray or gamma-ray detection was used.

The previously observed decay chain for ^{266}Bh as reported by Wilk et al. [7] is shown in Fig. 1. An online search for parent events with alpha energies between 8.8 MeV and 10.5 MeV was conducted during the experiment but did not immediately reveal the presence of any ^{266}Bh decays. Although offline analysis is ongoing, searches for parent events in the same energy range as above and subsequent daughter events in the range 8.0 MeV ≤ E_α ≤ 9.0 MeV, correlated within 120 s, have so far proven unsuccessful. This may be due to the half-life of ^{266}Bh being significantly lower than the ~1 s previously reported. The absence of definitive results precludes us from making statements about the viability of ^{266}Bh for chemical studies.

Footnotes and References

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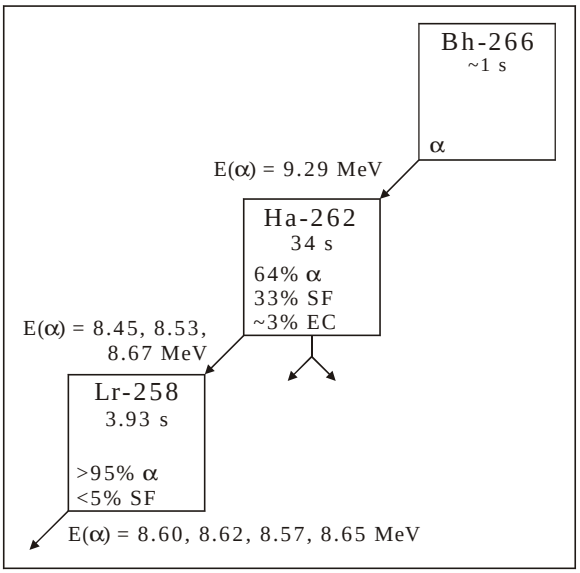

Fig. 1. Partial decay scheme of ^{266}Bh as reported by Wilk et al. [7].